Claims:

Cancel claims 1 through 6

What is claimed is:

1. A method for determining the dry density and moisture content percentage of soil using electrical means, the method comprising the steps of, Inserting two conducting electrodes into the soil to be measured, exciting the electrodes with an alternating current (AC) voltage, measuring the current through the soil, the voltage across the excited electrodes, and the phase relationship between the measured current and measured voltage, calculating from these measured values, the equivalent soil electrical resistanc and electrical capacitance, performing these steps several times on soils of differing densities and/or moisture contents, using standard geotechnical testing procedures to determine the wet density and unit weight of water in a test sample of each area of soil that was electrically measured, computing the best fit regression between the wet density and the soil real electrical impedance as calculated from the values of AC measurement frequency, electrical resistance, and electrical capacitance, computing the best fit regression between the unit weight of water as determined from the physical soil measurement, and the quotient of calculated soil electrical capacitance and soil electrical resistance, repeating the electrical measurements in new locations of the same soil type that have not been tested with physical means, calculating the equivalent soil electrical resistance, capacitance, and real impedance for these new locations, using the regression equations developed from initial calibration testing to predict the wet density and unit weight of water for the new soil locations, and finally calculating the dry density and moisture content percentage from wet density and unit weight of water using standard geotechnical equations.

2. The method of claim **1** wherein the position, placement, and/or length of the conducting electrodes is varied to change the area and depth of the electrical measurement field in the soil.

3. The method of claim **1** wherein the number of conducting electrodes may be more than two.

4. The method of claim **1** wherein the calculations, computations, regressions, and other mathematical or logical manipulations are automatically performed and the results displayed using an electronic computing device.

5. The method of claim **1** wherein the maximum dry density value for the soil being tested, as determined by geotechnical means, can be entered into the computing device, and using the EDG determined dry density, a calculation of percent compaction is displayed.

6. The method of claim **1** wherein the measured electrical values are automatically corrected for differences in soil temperature with suitable means.

Substitute new claims 7 and 8 as follows:

What is claimed is:

7. An Electrical Density Gauge consisting of electrode means for electrically connecting to an in-situ test spot of compacted construction material (soil), electrical means for measuring the equivalent parallel resistance and equivalent parallel capacitance of said material, and means for performing the necessary computations and display of results, is calibrated by first measuring a plurality of in-situ test spots in a field of said construction material to determine values of said equivalent resistance and capacitance, then determining with the use of geotechnical means, the in-situ wet density and in-situ weight of water of the same plurality of test spots where electrical measurements were made, and with the use of said electronic computational means, the real impedance of the measured test samples is determined, the best fit regression equation between the physical wet density data points and real impedance data points is calculated, and also with the use of said electronic computational means, the ratio of measured capacitance and measured resistance is determined for all data points, then the best fit regression equation between the unit weight of water data points and capacitance / resistance ratio data points is calculated, said Electrical Density Gauge after being thus calibrated, is used to measure field test spots of the same type of construction material with previously unknown electrical characteristics and with the newly determined values of real impedance and capacitance / resistance ratio applied to the aforementioned regression equations, to compute a value of wet density and a value of unit weight of water for said unknown test spot, and using the aforementioned electronic computational means, the dry density of the constructional material at the unknown test spot is calculated from the wet density and unit weight of water.

8. The Electrical Density Gauge of Claim 1, wherein the value of maximum dry density of the tested constructional material as determined by geotechnical means is entered into the aforementioned computational means, and used with the newly determined value of dry density to compute the percent of maximum compaction of the constructional material at each field test spot.